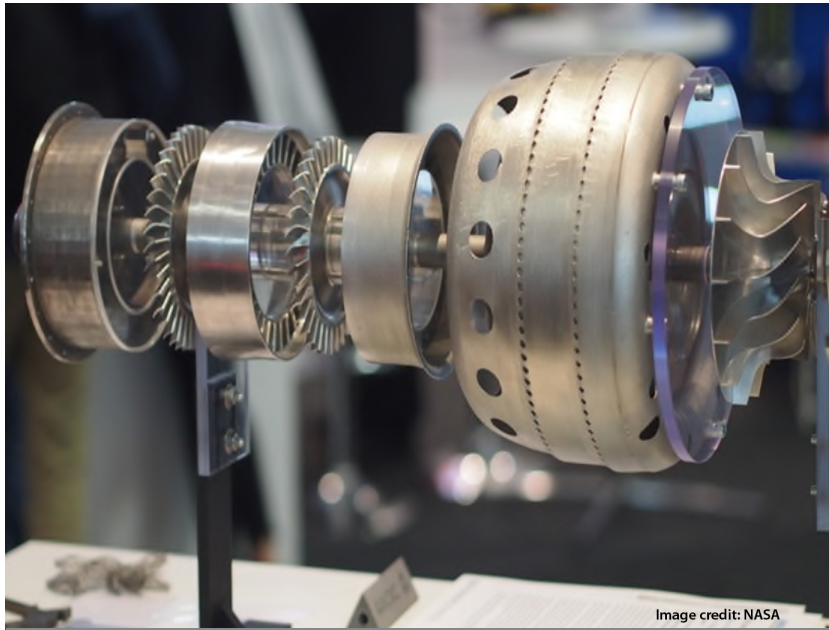


## TECHNOLOGY SOLUTION

### Robotics, Automation and Control



# In-situ Characterization and Inspection of Additive Manufacturing Deposits using Transient Infrared Thermography

[Superior in-situ, non-destructive, online inspection](#)

#### BENEFITS

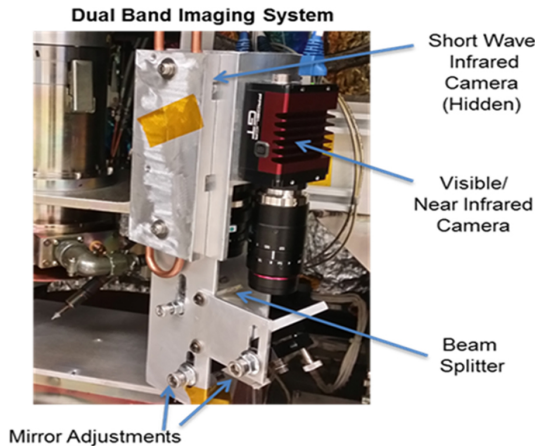
- More accurate
- In-Line
- Superior definition
- Time savings
- Non-destructive

Researchers at NASA Langley Research Center have developed a much more reliable non-destructive evaluation method based on infrared thermography. The method provides transient temperature profiles of the surface, including the melt pool, at each step/layer. This system can measure material properties and detect defects during the additive manufacturing process. It will allow for characterization of the deposition quality and also detection of deposition defects such as voids, crack, and disbonds as the structure is manufactured layer by layer. The information, in the form of quantitative inspection images, can be archived with the manufactured part to document structural integrity. This is a more effective way of determining flaws or deposition quality during the build process.



## THE TECHNOLOGY

Additive manufacturing or 3-D printing is a rapidly growing field where solid, objects can be produced layer by layer. This technology will have a significant impact in many areas including industrial manufacturing, medical, architecture, aerospace, and automotive. The advantages of additive manufacturing are reduction in material costs due to near net shape part builds, minimal machining required, computer assisted builds for rapid prototyping, and mass production capability. Traditional thermal nondestructive evaluation (NDE) techniques typically use a stationary heat source such as flash or quartz lamp heating to induce a temperature rise. The defects such as cracks, delamination damage, or voids block the heat flow and therefore cause a change in the transient heat flow response. There are drawbacks to these methods.



Working Prototype of the Inspection System With Infrared Sensor

## APPLICATIONS

The technology has several potential applications:

- Production efficiency
- Zero tooling costs
- Ubiquitous

## PUBLICATIONS

Patent No: 11,027,332

**More Information**

National Aeronautics and Space Administration  
**Agency Licensing Concierge**  
**Langley Research Center**  
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NP-2018-01-2517-HQ

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